47893/DBP/M521 SUBSTITUTE SPECIFICATION

DOOR MODULE FOR FIXING TO A DOOR BODY FORMING A BASE COMPONENT OF A MOTOR VEHICLE DOOR AND METHOD FOR ASSEMBLING A DOOR MODULE OF THIS KIND

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority of International application number PCT/DE00/03053, filed August 30, 2000, which in turn claims priority of German application number 199 42 650.3, filed August 30, 1999.

FIELD OF THE INVENTION

The invention relates to a door module for fixing on a door body, forming a base component of a motor vehicle door, as well as to a method for assembling a door module of this kind.

BACKGROUND OF THE INVENTION

A door module of the generic kind comprises a frame structure having a window frame, a flat surface assembly carrier for holding functional components of the vehicle door, on which at least the structural elements of the lift mechanism of a window lifter holding a window pane are pre-fitted, and one or more fixing nodes provided on the frame structure, where these fixing nodes are fixing sites provided on the frame structure through which the frame structure can be connected to the door body.

By door body, it is meant: a base component of a door having an outside door panel and an inside door panel which has a large-surface cut-out section which can be covered by the assembly carrier, or a holder for the assembly carrier which is connected to the outside panel of the door and extends towards the inside space of the vehicle, with the base component forming together with the

door frame and assembly carrier the essential supporting door components on which the additional function components of the vehicle door are fixed.

By structural components of a window lifter holding the window pane it is meant: those structural components of the window lifter which support the window pane and thereby fix its position in the vehicle door, thus, in the case of a cable window lifter in particular, the structural components comprise the guide rail and the follower guided on the guide rail and in the case of an arm window lifter, more particularly, the structural components comprise the at least one lever arm and the associated window pane socket.

A door module of the kind already described is known from German patent specification 997 009.

In US Patent No. 5 927 021 a vehicle door is described which consists of a door body and a door frame with an assembly carrier fixable on the door body. The door frame and assembly carrier are thereby combined into one structural unit and together are connected with swivel movement to the door body through adjusting means. The adjusting means which are provided for adjusting the door frame together with the assembly carrier relative to the body are thereby mounted on the door body.

From EP 0 405 159 A1 a vehicle door is known having a door body in which the door frame is integrated as a constituent part and on which an assembly carrier can be fixed in the form of two rails. However, there is no possibility for adjusting the door frame relative to the door body.

SUMMARY OF THE INVENTION

The object of the invention is therefore to improve the known door module so that the assembly of the vehicle door is facilitated, particularly with regard to adjusting the position of the different door components relative to each other.

Accordingly, the door module has a fixing node means or each fixing node means for adjusting the position of the window frame relative to the fixing node substantially transversely to the plane (door plane) in which the assembly carrier extends, i.e. the window frame is adjustable so that the adjusting movement has a component across the door plane.

The phrase "substantially across the door plane" is to refer to the fact that the plane defined by a vehicle door or its assembly carrier has as a rule curvatures and molded areas so that the definition of a door plane can always only be approximate.

The solution to the problems of the prior art provided by the current invention has the advantage that when fitting together the door module, a precise alignment of the window frame is possible relative to the fixing node or each fixing node, disposed transversely to the door plane (in which in particular the assembly carrier lies) so that the alignment of the window frame can be adapted precisely to the requirements demanded by the construction of the door body.

Preferably, the means for adjusting the position of the window frame relative to the fixing node are provided solely on the fixing node or on each fixing node.

The fixing node can be formed by a separate component part of the door module which can be fixedly connected to the assembly carrier and which holds the window frame adjustably.

In a preferred embodiment of the invention, the fixing node is mounted in the region of the upper end section of the assembly carrier facing the window opening whereby it protrudes at the same time in the door plane (xz-plane) laterally from the assembly carrier.

The fixing node is formed like a housing to hold parts of the window frame as well as providing a means for adjusting the position of the window frame.

The fixing node or each fixing node and the assembly carrier, preferably, form one pre-mountable structural unit, with respect to which the window frame can be adjusted across the extension plane of the assembly carrier. For this purpose the fixing node or each fixing node and the assembly carrier are connected together in suitable manner.

During a later assembly of the door module with the door body by connecting the fixing node to the door body, it is then only necessary to adjust the door module relative to the door body within the door plane (extension plane of the assembly carrier). The connection between the door module and door body can take place across the door plane without any adjusting play. The fixing node or each fixing node can have for this purpose an assembly pin which can be inserted into a corresponding socket of the door body and thereby enables a substantially play-free fixing of the relevant fixing node on the door body transverse to the door plane.

Through the said measures it becomes possible for the window frame to be adjusted (by swivelling) relative to both the door body and to the assembly carrier transverse to the door plane, whereby the adjustment of the window frame is undertaken directly through the fixing node, and the door body as well as the assembly carrier are fixed relative to the fixing node without any adjusting play perpendicular to the door plane.

If the door module has two fixing nodes then they are arranged one behind the other relative to the longitudinal direction of the vehicle so that - in relation to the front vehicle door - one fixing node is associated with the A-pillar of the vehicle and the other fixing node with the B-pillar of the vehicle. Each of the two fixing nodes can thereby have means for adjusting the position of the window frame or the means for adjusting the position of the window frame can be associated with only one of the fixing nodes, and in the region of the other fixing node the adjustment of the window frame is only completed passively.

Adjusting the position of the window frame across the door plane takes place in particular by swivelling the window frame about a swivel axis running substantially parallel to the longitudinal axis of the vehicle. To this end, the window frame and the relevant fixing node preferably interact on the ball and socket principle, and a wedge is provided which with one wedge face bears against the fixing node and with another wedge face bears against the window frame and can be displaced between the fixing node and the window frame in order to trigger swivel movement of the window frame relative to the fixing node. Instead of a displaceable wedge, a wedge can also be provided which can swivel in the door plane.

Swivelling the window frame is a special case of those particularly preferred adjusting movements where the component of the adjusting movement across the door plane is greater than the component lying in the door plane, thus form the main components of the adjusting movement.

The means for adjusting the position of the window frame should act independently of the fixing means through which the window frame is connected to the relevant fixing node. This means that the means for adjusting the position of the window frame relative to the fixing node are separate adjusting means which after first pre-fitting the window frame on the fixing node enable a deliberate adjustment of the position of the window frame relative to the fixing node. Only then can the final fixing of the window frame on the fixing node take place, whereby the fixing means used for this preferably at the same time locks the previously set position of the window frame.

In a preferred embodiment of the invention the door module additionally has means for reinforcing the door, which are provided in the breast area of the door without any such means extending in the longitudinal direction of the vehicle.

The means for reinforcing the door preferably comprise a longitudinally extended reinforcement element which runs in the longitudinal direction of the vehicle between two fixing nodes and is fixed on same.

In order to enable a keyed connection between the longitudinally extended reinforcement and the fixing node, the longitudinally extended reinforcement element is formed tubularly, at least in the

region of the fixing node and can be fitted onto corresponding pins of the fixing node in the manner of a plug-fit connection. The longitudinally extended reinforcement element is thereby supported on the fixing node at the same time.

Alternatively, a tubular section can be provided on the fixing node and is associated with a corresponding pin of the longitudinally extended reinforcement element.

In a preferred further development, the longitudinally extended reinforcement element is additionally connected to the assembly carrier, more particularly by welding, and the assembly carrier has in the region of the longitudinally extended reinforcement element a material strengthening and/or a longitudinally extended profiled shape wherein the latter can surround, at least in part, the reinforcement element. The reinforcement of the vehicle door in the breast area is thereby optimized.

Apart from the window lifter, further functional components of the vehicle door can also be pre-fitted on the assembly carrier.

In a vehicle door which consists of a door body forming a door base part and of a door module the door module on the one hand and the door body on the other are preferably formed so that the door module can be pushed with at least one section of its frame structure into the door body. To this end the door body has a corresponding socket shaft.

After inserting the door module into the door body it is still possible to adjust the position of the door module relative to the door body in the door plane. To this end bolts can be provided

which are associated with corresponding oblong holes extending along the relevant adjustment direction.

A method for assembling a vehicle door which consists of a door body forming a door base part, and a door module according to the invention is also discussed. According to this method, when assembling the vehicle door, first the position of the window frame is adjusted relative to the fixing node or each fixing node transverse to the door plane (extension plane of the assembly carrier) and then the door module is connected to the door body. After connecting the door module to the door body it is possible to carry out an adjustment of these two structural groups relative to each other inside the door plane.

The adjustment and assembly preferably take place by means of gauges which set the relevant reference points in relation to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages of the invention will now be apparent from the following description of an embodiment illustrated in the drawings in which:

Figure 1 shows a perspective view of a window frame associated with a front and rear fixing node;

Figure 2 shows a window frame according to Figure 1, with a window pane seal also shown;

Figure 3 shows a section of Figure 2;

Figure 4 shows a detailed view of the front fixing node;

Figures 5/6 show details of the rear fixing node in two different perspective views;

Figure 7 shows a perspective view of an assembly carrier on which different functional elements of the vehicle door are pre-fitted and which has a reinforcement in the breast area ;

Figure 8 shows a door module consisting of a window frame according to Figures 1 to 3, fixing nodes according to Figures 4 to 6 and the assembly carrier according to Figure 7 in the pre-assembled state;

Figure 9 shows a door body which is suitable for holding the door module of Figure 8;

Figure 10 shows an assembly stage during the assembly of the door module and door body;

Figure 11 shows the door module and door body in the assembled state;

Figure 12 shows a cross-sectional view of the illustration according to Figure 11.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows a frame structure of a vehicle door having a window frame 10 which has a front side frame part 11 and a rear side frame

part 12 which are connected together through an upper frame part 13 wherein the window frame has a guide channel 15 for a window pane.

The front frame part 11 is fixed on a front fixing node 2 on which an additional frame section 27 is molded in one piece. A rear fixing node 3 is associated with the rear frame part 12 in a similar manner.

Figure 2 shows, in addition to the components shown in Figure 1, a window pane seal 16 which is inserted in the guide channel 15 of the window frame 10.

Figure 3 shows a cross-section through the rear frame part 12 from which it can be seen that the window frame 10 is formed by an aluminum profile 14 of H-shaped cross-section preferably made by a stretch/bending process and having a guide channel 15 in which the pane seal 16 is inserted. The pane seal 16 is substantially U-shaped and holds a window pane 8 between its two arms.

Figure 4 shows the front fixing node 2 (on the A-pillar side) in detail. This fixing node 2 is an aluminum pressure cast component having a base body 20 on which are formed integral the frame section 27, a mirror triangle 29 and a projection 25 for holding an assembly carrier and a breast reinforcement.

The base body 20 of the front fixing node 2 holds the front frame part 11 of the window frame in a guide provided specially for the front frame part 11. Between an inner surface 21 of the fixing node 2 and the front frame part 11 is a wedge 6 whose inclined wedge faces converge upwards into a point and which adjoins by one wedge

face against the inner surface 21 of the fixing node and by its other wedge face against the front frame part 11.

Since the base body 20 of the front fixing node 2 has on its inner surface 21, facing the front frame part 11, a convex protrusion 22 against which the front frame part 11 bears, the front frame part 11 and the base body 20 of the front fixing node 2 interact in the region of this protrusion 22 (above the wedge 6) on a ball and socket principle. Moving the wedge 6 upwards therefore leads to a swivel movement of the front frame part 11 and thus of the entire window frame 10 about this protrusion 22 (see also the cross-section through the front fixing node 2 in the A-pillar side region of a vehicle door according to Figure 12). This swivel movement is due to the fact that displacement of the tapering wedge 6 upwards (towards the protrusion 22) in the region below the protrusion 22 causes displacement of the window frame 10 outwards (towards the door outside panel 91 according to Figure 12). This leads above the protrusion 22 to a movement of the window frame 10 in the opposite direction, thus towards the inside of the vehicle. Overall it results in a swivel movement of the window frame 10 about the protrusion 22 of the inner face 21 of the fixing node 2. This is synonymous with a swivel movement of the front frame part 11 and thus of the complete window frame 10 about the longitudinal axis of the vehicle (x-axis, see Figure 10) through which the frame part 11 can swivel out of the door plane (xz-plane).

From Figure 4 it can further be seen that the base body 20 of the front fixing node 2 has, in the region of the protrusion 22, a fixing opening 23c. This enables the front frame part 11 to be fixed on the base body 20 of the fixing node 2 in the region of the protrusion 22 by means of a suitable fixing bolt 63, see Figure 12.

It is also apparent that an additional fixing between the base part 20 and the front frame part 11 takes place in the region of the wedge 6 by means of a further fixing bolt 64 (for which the wedge has a corresponding oblong hole). Through the two fixing bolts 63, 64 it is possible to fix any adjustment of the front frame part 11 relative to the front fixing node 2 which occurs by displacing the wedge 6.

According to Figure 4 the base body 20 of the front fixing node 2 furthermore has a fixing opening 23d which serves for fixing on a door body by means of a fixing screw 103, see Figures 11 and 12.

From the base body 20 of the front fixing node 2 protrudes a projection 25 which is aligned in the longitudinal direction of the vehicle (x-direction, see Figure 10) and which has two fixing openings 24 for fixing a profiled upper section 42 of an assembly carrier as well as a pin 26 for holding a tubular reinforcement element 7. The profiled section 42 of an assembly carrier bears directly on the projection 25 of the front fixing node 2 and is additionally supported in the longitudinal direction on a support face 25a of the base body 20 of the fixing node 2. The fixing tube 7 is pushed onto the pin 26 and by its inner face 71 bears against the pin 26. The tube 7 is additionally supported in the longitudinal direction of the vehicle against a stop face 25b of the projection 25.

The upper section 42 of the assembly carrier 4 additionally defines at the same time the bottom of the window opening in the door module formed by the frame 10 (see Figures 1, 2, and 8). This window opening is defined through the frame parts 11 - 13 of the window frame 10 as well as through the upper section 42 of the

assembly carrier 44 which is provided with a reinforcement element, such as fixing tube 7.

At the bottom of the window frame 10, the frame section 27 is molded on the base body 20 of the fixing node 2 and has reinforcement ribs 27a, a fixing spot in the form of a fixing opening 27b for fixing on a door body as well as a window pane guide 28. The window pane guide 28 in the form of a guide channel continues upwards up to a mirror triangle 29 molded on the upper side of the base body 20 and on which an outside mirror can be fixed.

Figures 5 and 6 show, in two perspective illustrations, the rear fixing node 3 (thus the node on the B-pillar side in the case of a front door), which is formed as an aluminum pressure cast component.

The rear fixing node 3 comprises a base body 30 on which a projection 35 is molded to hold an assembly carrier as well as a tubular reinforcement element, such as tube 7. The projection 35 has two fixing spots in the form of fixing openings 34 through which the upper section of an assembly carrier can be fixed on the rear fixing node 3 wherein the assembly carrier can be supported additionally in the longitudinal direction of the vehicle on a stop face 35a of the base body 30 of the rear fixing node 3. Furthermore on the projection 35 there is also a molded pin 36 extending in the longitudinal direction of the vehicle (x-direction, see Figure 10) and on which a tubular reinforcement element can be pushed whereby the tubular reinforcement element is additionally associated with a stop face 35b on the projection 35 on which it can be supported in the longitudinal direction of the vehicle.

The base body 30 of the rear fixing node 3 has a guide for holding the rear frame part 12, wherein a wedge 6 is inserted between an inner surface 31 of the base body 30 facing the rear frame part 12, and an inner surface of the frame part 12, with the two wedge faces of the wedge 6 converging upwards to a point.

Furthermore the base body 30 of the rear fixing node 3 has on its inner surface 31 facing the frame part 12 a convex shaped protrusion 32 on which the fixing node 3 and the rear frame part 12 interact according to a ball and socket principle. In the same way as in the front fixing node 2 by sliding the wedge 6 up or down it is possible to achieve a swivel movement of the rear frame part 12 about the longitudinal axis of the vehicle. The upper section of the rear frame part 12 is thereby swivelled towards the inside of the vehicle when the wedge 6 is moved upwards, while sliding the wedge 6 downwards causes the opposite swivel movement of the frame part 12.

The base body 30 of the rear fixing node 3 has according to Figures 5 and 6 two fixing openings in the form of threaded holes 33b, 33c of which one is provided in the region of the wedge 6 and the other in the region of the convex protrusion 32. It is thereby clear from Figure 6 that the wedge 6 is provided with an oblong hole 6a which interacts with the associated fixing opening 33b and also allows, after a longitudinal displacement of the wedge 6, the passage of a suitable fixing member, such as a bolt, on one side through the fixing opening 33b and on the other through the wedge 6. A corresponding oblong hole is also provided in the case of the wedge 6 associated with the front fixing node 2, even though it cannot be seen in Figure 4. Thus by means of suitable fixing bolts it is possible to fix the rear frame part 12 and the rear fixing node 3

against each other after a suitable adjustment of the frame 12 relative to the fixing node 3 which occurs by means of sliding the wedge 6.

Figures 5 and 6 also show a pin 30a of the base body 30 of the fixing node 3 as well as two further fixing openings 33a, 33d. The pin 30a serves for fitting into a corresponding socket of a door body so that the fixing node 3 is supported on the door body through the pin 30a. The fixing openings 33a, 33d serve to connect the rear fixing node 3 with the door body, see Figures 11 and 12.

Figure 7 shows an assembly carrier on which a number of functional components of a vehicle door are prefitted and which can be assembled together with the frame structure 1, shown in Figure 1, into one door module.

The assembly carrier consists of a support plate 40 having a recess 41 as well as a profiled upper section 42 which is associated with the breast area of the vehicle door, see also Figure 10.

The profiled section 42 of the assembly carrier 4 has a material reinforcement compared to the support plate 40, wherein the reinforced material section is connected by means of laser welding to the remaining part of the assembly carrier 4. The profiled section 42 of the assembly carrier 4 furthermore comprises a longitudinally extending reinforcement element in the form of the tube 7 which extends along the longitudinal axis of the vehicle (x-axis, see Figure 10). The tube 7 is likewise connected to the profiled section 42 of the assembly carrier 4 through laser welding.

As a result of the stiffening of the assembly carrier 4 in the breast area of the door through profiling the corresponding section 42 of the assembly carrier, by using a material having a greater material thickness compared with the support plate 40 as well as by additionally fitting a longitudinally extending reinforcement element in the form of the tube 7, the assembly carrier 4 is strengthened considerably both in respect of pressure forces (which occur in the event of a front impact crash) and bending forces (following a side impact crash). Thus important elements are already integrated in the assembly carrier 4 here to secure and strengthen the door against a front or side impact crash; therefore no such reinforcement element need be provided in the door body itself, see Figure 9.

The assembly carrier 4 furthermore has a diagonal reinforcement element 43 which extends over the cut-out section 41 of the support plate 40, as well as a number of fixing sites in the form of fixing openings 46 for connection with a door body, see Figures 10 and 11.

The support plate 40 of the assembly carrier 4 serves to hold a number of functional components of the vehicle door which are prefitted on the support plate 40. Thus an arm rest 51 is fixed directly on the support plate 40 and has a grab handle 51a, a door inside opener 51b as well as a number of operating elements 51d wherein the operating elements 51d serve to operate different electrical functional elements of the vehicle, e.g. an electric door lock, a window lifter etc. Furthermore the support plate 40 supports an electric door lock 52 which can be locked through one of the operating elements of the operating zone 51d of the arm rest 50 and which is furthermore in active connection with the door inside opener 51b through a coupling element 51c.

Furthermore a window lifter 53 is prefitted on the support plate 40 and comprises an electrical drive unit 53a, a draw member in the form of a cable 53b movable by means of the drive unit 53a, a guide rail 53c as well as a follower 53d which is guided on the guide rail 53c and is movable by means of the draw member 53b. This follower 53d supports the window pane 8 and thus serves to connect the window pane 8 to the window lifter 53. Finally a speaker 54 of an audio unit is fixed on the support plate 40.

Figure 8 shows the door module according to the invention in the assembled state according to which the assembly carrier 4 has been connected to the frame structure 1. Fixing screws 49 are thereby used for fixing the frame structure 1 to the assembly carrier 4 such that the screws 49 engage on one side through the oblong holes 48 in the upper profiled section 42 of the assembly carrier 4 (see Figure 7) as well as on the other side through the internally threaded fixing openings 24, 34 in the projections 25, 35 of the front and rear fixing node 2, 3 (see Figures 4 - 6).

From Figure 8 it is apparent that the longitudinally extended profiled upper section 42 of the assembly carrier 4, as well as the longitudinally extended reinforcement element in the form of the tube 7, extend in the breast area B of the door module.

In the state of the door module 4 shown in Figure 8, wherein the frame structure 1 and the assembly carrier 4 are connected (initially provisionally), the window frame 10 can be adjusted relative to the fixing nodes 2, 3 and thus also relative to the assembly carrier 4 transverse to the extension plane of the assembly carrier 4 (thus the xz-plane). As already explained with respect to Figures 4 to 6 and 12, this adjustment occurs when

inside the front or rear fixing node 2, 3 corresponding wedges 6 are moved up or down along the z-axis which results in a swivel movement of the window frame 10 about an axis (the vehicle longitudinal axis) running along the vehicle longitudinal direction (x-direction). The position of the window frame 10 is thus adjusted across the extension plane of the assembly carrier 4 (thus along the y-direction and transversely to the xz-plane). This adjusted position is then fixed in place by suitable fixing means, see Figure 12.

The adjustment occurs prior to connecting the complete vehicle door, thus in particular before installing the door module shown in Figure 8 into a corresponding door body. Adjustment is carried out using gauges which set selected reference points of the fixing node 2, 3 on one side and the door frame 10 on the other side in relation to each other.

As a result, during a subsequent installation of the door module into the door body no further adjustment of the window frame 10 is required. In particular a complete tuning of the adjustment of the window frame 10 on one side and window lifter 53 on the other can already be undertaken in advance, particularly in view of the fact that the window pane 8, displaceable by the window lifter 53, is guided properly in the guide channel 14 of the door frame 10.

It is thereby important that the door module illustrated in Figure 8 can be fully checked over outside of the vehicle door since it comprises not only the essential functional components of the vehicle door (window lifter and door lock) but also the associated operating elements integrated in the arm rest 50 by which these functional components can be controlled.

Figure 9 shows a door body 9 forming a door base part (lower part of the door bodywork) and comprising a door outside panel 91 and a door inside panel 92 which is provided with a large surface cut out section 93, which are connected together, inter alia, at the side ends 95a, 95b of the door body 9. A reinforcement rib 94 extends transverse over the large surface cut out section 93 of the door inside panel 92. Furthermore a number of protrusions project into the cut out section 93, which have fixing sites in the form of fixing openings 96 to connect with the assembly carrier 4 through its fixing openings 46 (see Figure 7).

The door body 9 forms a door base part in the form of a door shaft with two side shaft guides 90a, 90b in which the frame structure 1 can be inserted by its fixing nodes 2, 3 (see Figure 8). Sockets 99a, 99b in the region of the front and rear shaft guide 90a, 90b thereby serve to hold corresponding pins of the front and rear fixing nodes and oblong holes 97a, 98a; 97b, 98b in the front and rear shaft guides 90a, 90b serve to adjust the door module relative to the door body inside the door plane (xz-plane, see Figure 10).

Figure 9 also shows an outside mirror A and a mirror holder S in dotted lines; these are however not fixed on the door body 9 but rather on the mirror triangle 29 which is integrally molded on the front fixing node 2 (see Figure 4).

Figure 10 shows an assembly step during the assembly of a vehicle door comprising the door module illustrated in Figure 8 and the door body 9 illustrated in Figure 9.

The frame structure 1 of the door module is inserted from above into the shaft guides 90a, 90b of the door body 9, whereby the

front shaft guide 90a is associated with the front fixing node 2 and the rear shaft guide 90b is associated with the rear fixing node 3. Lowering the frame structure 1 into the shaft guide 90a, 90b of the door body 9 is concluded when the pins 20a, 30a, provided for this purpose on the front and rear fixing nodes 2, 3, lie in the corresponding sockets 99a, 99b of the door body 9.

The frame structure 1 and door body 9 are then connected together initially provisionally. In this state the frame structure 1 is adjusted relative to the door body 9 in the door plane (xz-plane). The oblong holes 97a, 98a as well as 97b, 98b (see also Figure 9) of the front and rear shaft guide 90a, 90b serve this purpose. These holes form a reference point system relative to which the fixing holes 23a, 23b and 33a, 33b (see also Figures 4 - 6) provided, for this purpose, in the front and rear fixing nodes 2, 3 are aligned by means of suitable gauges.

When this adjusting process has been completed, the front and rear fixing nodes 2, 3 are fixed in the front and rear shaft guides 90a, 90b respectively by means of fixing screws 102, 103 (see Figures 11 and 12), whereby these fixing screws engage on one side through the oblong holes 97a, 98a; 97b, 98b and on the other through the internally threaded fixing node openings 23a, 23b, 33a, 33b.

An adjustment of the window frame 10 relative to the door body 9 across the door plane (thus in the y-direction, across the xz-plane) is, however, no longer necessary; for the window frame 10 was already adjusted in this direction relative to the fixing nodes 2, 3 and the assembly carrier 4 prior to attaching the frame structure 1 to the door body 9. The fixing nodes 2, 3 are therefore

inserted into the corresponding shaft guides 90a, 90b without any adjusting play relative to the y-direction.

Furthermore the frame part 27 is fixed onto the door body 9 through an oblong hole 98' in the door inside panel 92 by means of a fixing screw 104 which is associated with an internal thread 27b in the frame part 27 molded in one piece on the front fixing node 2.

Figures 10 and 11 furthermore show that further fixing screws 101 are provided in order to fix the assembly carrier 4 on the door body 9 through its fixing openings 46 and the associated fixing openings 96 on the door body.

Figure 12 shows a cross section through the vehicle door illustrated in Figures 10 and 11 in the region of the front fixing node 2. This illustration is of interest, in particular, with regard to adjusting the door frame relative to the front fixing node 2 as was already explained in connection with Figures 4 to 6.

Figure 12 shows that the door outside panel 91 is connected to the door inside panel 92 through a connecting site 91', on the base side, in the region of the front side end 95a of the door body 9.